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RESEARCH IN PATHOLOGICAL PSYCHOLOGY AND BIOCHEMISTRY¹

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Research in the pathology of mental disease has a history of peculiar interest; progress has been indirect and difficult in this branch of the medical sciences because of both favoring and conflicting influences. In modern psychiatry laboratory investigations were first employed to find in anatomical pathology explanations of mental disorders. Great progress has been made in the 70 years since Griesinger published his work on mental disease. During the first 20 years of that period he was the first to establish psychiatry upon the basis of scientific research and pathological principles. During the next 20 years several contributing movements, having their genesis in the advancement of general medicine, gained headway or had their inception; in America, a new interest arose in pathological investigations in institutions for the insane, and among them the plan was formed at the McLean Asylum (Hospital after 1892) to add to the pathological laboratory two other laboratories in order to combine researches in physiological and pathological psychology and biochemistry with the clinical work. In 1889, after ten years of preparatory observation, under the inspiration of general medicine and the "new psychology," these combined laboratories were fully organized and equipped for beginning researches by the methods then available.

In the laboratory movement of the time the new combination here described was the outcome of definite concurring influences, which, with their sources, should be recognized for their historical significance. The McLean Hospital laboratories reflected contemporary trends leading to the momentous changes which are now revolutionizing ideas that have long dominated psychiatry; it is important to note what these changes have contributed to a stage of progress that has been slow in awakening the attention of alienists. In the asylums, as they were constituted in the decade of 1880-90, the medical service was concerned with a number of quite distinct major problems in

¹ An account of the laboratories of the McLean Hospital. Reprinted from *The Institutional Care of the Insane*, 1916, Vol. 2, pp. 618-636, with added notes and references.

theory and practice; these related (1) to the methods by which explanations of mental disorder were sought in the findings of the pathological laboratory; (2) the generally accepted psychological conceptions and formulæ descriptive of mental physiology and of mental diseases for their classification; (3) the physical conditions associated with mental diseases and their causes with respect to the principles of general physiology and of general medicine; (4) the practical methods of treatment of the different forms of these diseases.

THE GENERAL POSITION OF PSYCHIATRY IN AMERICA IN ITS THEORY AND PRACTICE, 1880-90

The attitude of the alienists toward their problems was one of newly stimulated interest. Some of the difficulties met with and the obstructive effects of certain misleading contradictions in the formulations of the problems should be noted; they will appear in the following account of the McLean laboratories as an example of the general efforts toward progress. The purpose, course pursued and results accomplished can be better understood by indicating here the observations concerning the nature of the major problems that prompted the laboratory investigations. (1) The alienists were subject, by general consent, to the claims of pathological anatomy as the master science in general pathology; they looked to it for a basis of scientific psychiatry, but it was hope deferred, and they remained under the reproach of being unscientific. Although the new science of neurology, claiming psychiatry as a part of itself, was then bringing much aid, yet within 20 years thereafter it reached one of its authoritative conclusions that "pathological anatomy is of more academic than practical interest to the psychiatrist . . . the burden of our work should be away from morphology and more in physiologic lines." This of course did not deny the essential value of pathological morphology in association with these fields of investigation.

(2) Mental physiology, with true explaining principles in the physical mechanism, was the immediate need of the alienists for the investigation of abnormal behavior, and the first step in "tracing back symptoms to structural changes in accordance with the principles of general pathology." Lacking such explanations and limited to descriptive classifications of clinical symptoms, the alienists avoided the speculations of academic psychology which gave little aid. Thus, in common with all the world, they adopted the general empirical conception of the intellect, feelings and will; and in terms of these conceptions they framed their descriptions of the mental activi-

ties. Twenty years prior to the time under consideration Griesinger was making the bequest of his conceptions of mental pathology universally followed in modern psychiatry; his formulations of the symptom-complexes of melancholia and mania still dominate our descriptions of melancholia as "states of mental depression," and mania as "states of mental exaltation."

These phrases condense one of the most fundamental and general concepts of psychiatric theory into two words, "depression" and "exaltation," used as physical metaphors for the contrast of the feelings of pain and pleasure, which present a true "oppositeness" of *quality* of feeling or emotion—both normal and morbid. But while "depression" always fitted melancholy states, "exaltation" was found to be far from constant in maniacal states and not to fit the physical facts; and the make-shift word "excitement" came into use in its motor sense. To-day we frame our descriptions around "depression" and "excitement," making a false differential of emotion and activity, which always seems to imply a *quantitative* contrast of decrease and increase; whereas, on the contrary, in the states of real physical depression with constant mental pain there is always increase of its intensity and often motor agitation, while in the states of excitement—of shifting emotion and motor activity—there are further real decreases of integrity of both mental and physical functions and descent to "deeper levels of destruction." Such are some of the contradictions in this slough of despond for scientific psychiatric thinking and experiment. There is no way of escape but to abandon it. It is an inheritance from the most primitive experiences of an ever-widening range of such concepts of the feelings, as of pleasure and pain, joy and sadness, hope and fear, as expressed in such figures of speech as exaltation and depression, being uplifted or downcast, and innumerable analogues of highness and lowness in the moral sense; thus have been drawn into the complex conceptions of the feelings the physical meanings of such ambiguous words.

There can be no change in the common usage of such picturesque analogies and physical metaphors; but in the present instance they are destructive and unfit. The remedy must be by passing from facile description to the explanatory level; and to the advancement of laboratory investigations in psychology, psychiatry and physiology are due the definite signs of emergence in recent years. In 30 years, or since the beginnings of Wundt's psychophysics experiments to Pawlow's and Cannon's latest discoveries in the physiologic relations of protective bodily changes to emotional reactions, there has been a revolution of ideas through the contributions of physiology to psychiatry.²

² "For a number of years, and particularly since the publication of Pawlow's work on the effects of emotion upon glandular action, there has been a wide and increasing interest among psychologists and physiologists in the more intimate bodily mechanism underlying emotional processes. This movement has coincided with a rapidly growing

(3) The physical conditions associated with mental diseases were of constant interest to the alienists; systems of classification were attempted, based upon the etiology of mental disorders as sequences of general diseases. This tended to aid in prompting the purpose of the laboratories which grew out of the conditions observed in the preceding ten years, showing the need of physiological investigations to explain the psychological problems. Some of the fallacies of the conceptions of them have been noted in the foregoing statements to show the reasons for the attempt to apply new methods. The attitude of inquiry is indicated by the position taken in respect to Griesinger's description of contrasting mental states before quoted. Beginning in 1885, and since then carried forward in annual courses of lectures and in projecting these laboratories, the view has been presented as the belief of many alienists that melancholia and mania constitute one disease, with stages declining to dementia. It was proposed two years later, in an unpublished paper on classification, to amend Griesinger's formulations to read "states of depression of feeling" and "states of derangement of intellect," for the reasons that while the persistent mental pain characteristic of the first stage reflects truly the bodily malaise, the second stage is characterized by graver derangements of thinking and unstable emotional states, showing their disordered relations with the bodily ill-being and the losses of functional power and control. This was known to have been essentially the position taken by Griesinger, but it can be better appreciated in the light of later understanding by newly studying his writings, which reveal his vigorous but unheeded protest against the immediate misinterpretation by his contemporaries of his psychological meanings. Limiting the present view of the situation to what it was in the decade prior to 1889, it can now be seen that he used the words "depression" and "exaltation" in their figurative sense, as did the contemporary alienists, psychologists and all the world besides, following the ancient and fixed usage. But he meant simply "mental pain" and the emotional contrast; he did not mean an oppositeness of "mental torpor" and "mental irritation"—an "increase" or "decrease" of some-

appreciation among physiologists and physicians of the organic significance of certain of the so-called ductless glands, and of the physiological importance of gland and muscle tissue in general. Already the discoveries made have quite revolutionized many of the ideas of a generation ago, and the chapter seems hardly more than begun." James R. Angell, Review of Cannon's work on "Bodily Changes in Pain, Hunger, Fear and Rage. Recent Researches into the Function of Emotional Excitement;" and Crile's work on "The Nature and Origin of the Emotions." *Science*, Nov. 12, 1915.

thing. Yet the psychiatric world still clings to the ancient, unscientific conception of a physical *something, up or down*, although the physiological investigations of the laboratories have been proving for 30 years that Griesinger was right. The following narration of events will show the course of progress, and what was done with the ancient conceptions when the new psychology brought psycho-physic experiment into psychiatry.

(4) The most significant indication of the attitude of the alienists of 30 years ago toward general medicine was their position with respect to the practical methods of treatment. They had been the leaders in the adoption of the "supporting treatment" for many years in advance of general medicine—a logical, though empirical, expression of their comprehension of the physiological principles of the energy concept. Here was the basis of the vogue of the neurasthenic concept developed in the science of neurology. This was the crux of the matter from which came the inspiration to research in the chemistry of nutrition. The "fatigue question" and the "nutrition question" were "believed to be of primary importance in psychiatry." Hence as an outcome the laboratory of biochemistry. The psychological laboratory was added by direct importation from the laboratory of Ludwig at Leipsic, through Dr. Stanley Hall and the department of psychology at The Johns Hopkins University. These preliminary comments have a certain historical interest; they are also needed not only to show the origins of this laboratory movement, but to state the problems with which it had to contend, and which essentially form the basis of the conclusions that emerge from the broader review of the whole matter.

NOTE.—The main events on the medical side of the laboratory movement at its beginning, indicate the conditions under which the aid offered by psychology had to make its way. While some of the earlier alienists, usually chosen men of attainment in general medicine, gave special attention to pathology it was not until 1868 that Gray at Utica, first in this country, organized a department for such research by appointing a pathologist; this was continued during his service till 1886. Through this period there was increasing interest in such investigation by individual members of the medical staff in some of the asylums. But the most stimulating influence of the time was the work of Folsom in Massachusetts, then Secretary of the State Board of Health, which included the supervision of the care of the insane; his historical monograph on "Disease of the Mind," 1876, showing European and American progress, and his observations, especially of English and Scotch methods, aroused great interest; many of our younger alienists went to study them during the next decade.

At this time the pathologists were non-resident, appointed for occasional service. The Government Hospital in Washington made a great

step in advance by establishing a permanent department, the most efficient of the time, for scientific work with the appointment of a special pathologist in 1883. This work in clinical pathology was of the best order and was maintained until 1906 when the scope of the department was extended by the appointment of an expert psychologist experienced in pathological psychology and not a physician, to be the scientific director with various assistants. This combined service has sustained its hopeful purpose. This event is significant of the long cycles of time taken for such an innovation as that of pure psychology into psychiatry; Dr. Franz had been for four years before the first expert psychologist in such a service at McLean Hospital, where twenty years before Dr. Noyes was appointed pathologist also to direct especially the chemical research as well as to apply the psychology he had learned from Stanley Hall at Johns Hopkins University.

In the next following decade, 1890-1900, the general movement became more manifest, and resident pathologists were appointed. At Kankakee, Dr. Meyer took charge in 1893, and went to Worcester in 1896; at Danvers, Dr. Worcester was appointed in 1895; at Indianapolis a spacious pathological building was opened in 1895; and at the Sheppard and Enoch Pratt Hospital, Dr. Paton was appointed in 1899; all of these and other like efforts have established their value as important adjuncts in the progress of the clinical work. It appears in all that the initiative purpose was for scientific investigations in pathology.

This was also the essential purpose of the largest undertaking in that decade, the State Pathological Institute in New York city in 1895. The State Commission and Dr. Van Gieson, the director, had ambitious and comprehensive conceptions of the main purpose of this central influence for guiding the scientific work of all the hospitals. Progress was made in organizing the pathological work; there were interesting beginnings in the study of psychological problems and of chemical investigations. But its history shows that the disadvantages of its being detached from a clinical service and the danger of failure in its being supported in its costly location caused its removal to Ward's Island, where it could be in connection with hospital wards assigned to it, and be afforded facilities for developing a practical field for co-ordinating all the investigations which would invite attention in an economic association with a clinical service; this would obviously claim existence for its own sake. This original purpose was promoted and broadened; the way of progress opened wide under the direction of Dr. Meyer who came there from Worcester in 1902 and was succeeded in 1910 by Dr. Hoch with an experience of twelve years in the McLean laboratories and five years at Bloomingdale Hospital. The trend of progress of this great establishment is indicated by the change of name from Pathological to Psychiatric Institute. The facts accomplished in its course of twenty years need no recital here of what it has done in applied psychology. These references to the origins of the laboratory movement and the concurring events in the quarter century before 1900 indicate the circumstances contemporary with the following account of the McLean laboratories. Out of these labors of that time has come the later remarkable development of reception wards, and psychopathic hospitals tending to the provision of a psychopathic building in every hospital. The significance of all this is very great, and the appeal to psychology, the master science of psychiatry, and points to the need of trained psy-

chologists, as well as pathologists in the laboratories. Every date mentioned implies years of preparatory projects obstructed and delayed; the following history shows twelve years of active work in the combining of researches and prior years of preparation before 1900, in the McLean laboratories. Up to that time such a combination of psychology and chemistry with pathology and the clinic had not been projected elsewhere. It was a few years later there when first a trained psychologist, also a teacher of neural physiology, was persuaded to enter this special field for a professional career, in this country, and later one other followed him; these, with a few others more recently, amply justify the coming demand for this great service to psychiatry.

THE ORGANIZATION OF THE LABORATORIES

The new laboratories at the McLean Hospital were early attempts to combine the methods of physiological, biochemical and psychological experiment, under the principles of general medicine, in the clinical work in such institutions. The general progress made was noted in the annual reports; of special interest are those from 1888 to 1892, describing the establishment of the three laboratories, and a review of the work of the hospital in the reports for 1901 and 1902. Biological chemistry and physiological psychology were held to have an essential dependence upon each other. The conception of the chemical laboratory as a clinical aid in psychiatry had a longer incubation and was the direct expression of the neurasthenic concept, or, better, the energy concept. Here, as before noted, there was a direct sequence of events. From the time of the "supporting treatment" and Griesinger's recognition of the principle of reduction of energy in the relation between melancholia and mania, the energy concept had been gaining its place of fundamental importance in general medicine, and has held it in the practice of psychiatry, though much obscured and mostly lost to sight in theory.

The aims of the combination of the laboratories were comprehensively stated in a report on the psychological laboratories in America, contributed to the *Année Psychologique* in 1894 by Dr. Delabarre, in which the McLean Hospital psychological laboratory and its equipment were described as follows:

"The purpose of establishing and developing the laboratory has been carried on under much difficulty, naturally due to the newness of the attempt to combine with psychiatry the other departments of scientific medical research. The pathology of the terminal stages of insanity must be studied as heretofore, and it is necessary to add that of the initial conditions which lead to mental disorder. Such studies must therefore be combined with physiological psychology in the attempt to determine the exact nature and causes of departures from

normal mental function. Also in the dependence of these changes upon general physiological processes, and in order to take into account all the elements of vital activity involved, it is supremely necessary to study both physiological and pathological chemistry in their direct and indirect relations to mental changes. It will be seen by the foregoing report that the fatigue question, and its relation to auto-intoxication, is believed to be of primary importance in psychiatry. It is inevitable that progress must be slow in developing these several concurrent lines of inquiry; but the researches already begun are most interesting and promising, and encourage the hope that the work which is contemplated will so effectively combine them all as to yield worthy results."³

The laboratory, with its two purposes, was described by Dr. Delabarre as "the only one in America which united psychiatry and physiological psychology. In Germany there exists only one like it—that of Professor Kraepelin at Heidelberg. It attempts to combine the studies of the clinic and of neurology with those of chemistry on the one hand, and with those of psychology on the other."

In a lecture on "Neurasthenia" in 1891, and in other papers,⁴ there is an extended discussion of the energy concept as it is involved in the successive reductions of functional capacity in neurasthenia, melancholia and mania, considered as stages of one disease—meaning that a *neurasthenic condition* underlies all of these phases.

The laboratories were under the direction of Dr. Noyes, appointed in 1888 and continuing till 1893, including that of pathological anatomy; and a seminary was organized by the medical staff for study in psychology and psychiatry. The equipment for psychological experiment was guided by that of Dr. Hall at Johns Hopkins University, and at Harvard Medical School, aided by the counsel of Dr. Bowditch and Prof. James; the chemical work had the valuable advice of Dr. Wood and Dr. Chittenden. The direction of the three laboratories was continued by Dr. Hoch for nearly twelve years, beginning in 1894; during nearly two years in Europe, his studies, mainly in pathology at Strasburg, and at Heidelberg with Nissl, had been extended to special preparation for the service at McLean Hospital by devoting time to the work of Kraepelin, Wundt and Mosso. The provision of ample rooms

³ "Les Laboratoires de Psychologie en Amerique," by E. B. Delabarre, *L'Année Psychologique*, 1895; also "Laboratory of McLean Hospital," by G. Stanley Hall, *Amer. Jour. Insanity*, 1895.

⁴ "Neurasthenia and its Mental Symptoms," Shattuck Lecture, E. Cowles, *Amer. Jour. Insanity*, 1891; "The Mental Symptoms of Fatigue," *Trans. N. Y. State Med. Assn.*, 1893; also "The Problem of Psychiatry in the Functional Psychoses," *Amer. Jour. Insanity*, 1905. See also "The Mechanism of Insanity," *Ibid.*, 1889-91.

and equipment for research in the new McLean Hospital, opened in 1895, was justified by the early experience. The claim of the chemical laboratory to a place in clinical psychiatry was established by the investigations of Dr. Folin, who took charge of it in 1900, when he applied the methods of pure chemistry and gave it a recognized distinction. The development of the work as a whole was aided directly by the conceptions of the English physiologists. It was noted at the outset that the clinical questions were characteristically associated with causes producing neurasthenic conditions, and with recoveries through restoration of the general health and strength. As stated later by Dr. Folin, "the problem to be dealt with in such cases is very largely that of nutrition, and the nutrition question is fundamentally a chemical one; also that it is disorders of metabolism that have a large part in the derangements of nutrition and dependent functions of the nervous system; and it is to such derangements that disorders of the mental function may be due in many cases." The purpose from the first was to approach such problems from the side of general medicine and to determine "what conclusions can be reached concerning the important question whether any tangible relation between faulty nutrition or other faulty metabolism and different forms of mental disease can be established." This implies the study of the influence of functionally disordered bodily conditions and organic sensations causing alteration of the "sense of well-being" and "personality," and of the "sense of adequacy," producing obstructive interferences with the processes of feeling, thinking and doing. The reactions of the emotions were recognized, when first undertaking the joint investigations, as essential factors of the utmost importance, in "the changes in nervous reactions in health and disease, the relation of the mental element as to its interferences with these reactions, and the counter influence of bodily conditions upon mental states." The conclusion was drawn that "in acute neurasthenia and in true melancholia and mania there is always nutritional and toxic functional weakness, fundamentally, in the organism; it is from this that the influences arise which affect the conscious feeling and thinking, making these higher mental states the sensitive indices of the lower physical changes."⁵

⁵ Op. cit. *Neurasthenia and its Mental Symptoms*, 1891. The quotation continues: "When ail goes well with the organism and it is in a condition of unfelt equilibrium, the processes of thinking and feeling are adjusted, more or less logically, to the varying environment upon a basis of a sense of well-being and normal love of life. On the other hand, a morbid process may be started in these higher

In this view it was believed that all the operations, physical and chemical, of the nervous and mental mechanism, should be studied as being conditioned by the contributing and concurring activities in both fields, and as having a primary and necessary relation to the supporting energy. The conscious attitude of the moment, having its inseparable emotional factors, affecting both the mental response and the physical reactions, these in turn must condition, and may determine, a persistent affective tone, especially when of pathological intensity. "The phenomena of nervous life are the outcome of a contest between what we may call inhibitory and exciting or augmenting forces" (Foster, Physiology). Voluntary action is at all times the resultant of the compounding of our impulses with our inhibitions (James).

The point of present interest is that these laboratories and their combination were simply outcomes of principles then generally recognized, but awaiting effective acceptance in psychiatry. The significant exception to this was that the energy concept which, having given psychiatry the leadership as its long-used practical guide for treatment, had gained only a slow and limited appreciation of its special physiological and biochemical import for mental diseases. The result followed that psychiatry has engaged itself in working out other trends of

activities, in a previously healthy and strong organism; but until the organism itself suffers a change to the specified nutritional and functional weakness there can be no such mental symptoms as are being studied here. Normal mental activities cannot produce 'mental symptoms' except by first causing the characteristic 'weakness' somewhere in the physical basis of all of them."

It is of great historical interest in this connection that one who newly reads Griesinger's conceptions of more than 70 years ago may trace the substantial evidence throughout of their underlying continuance and growing force to the present time. The words he wrote in 1861 have lost none of their significance: "I would therefore beg the readers wherever doctrines, pages, and even chapters, occur similar, or nearly similar, to what they may shortly before have read in books or journals, simply to compare them with the first edition of this work which appeared in 1845." Describing the states of melancholia as most frequently appearing to be the direct continuation of some painful emotion dependent upon some external influences, he notes the cases without apparent moral causes in which it "does not originate as their direct continuation, but only shows itself after these affections have wrought considerable disturbance in the functions and nutrition of the nervous system, or have undermined the entire constitution." We have learned to distinguish neurasthenic conditions from the "hypochondria" of those days; Griesinger observed that the states of the painful emotion may "proceed from a strong *feeling of bodily illness*." Going further, he regarded the "states of mania as engendered by melancholia" and as a "still deeper destruction;" he never lost sight of the principle which is fundamental in all progress in the modern treatment of insanity.

inquiry and has neglected the study of its most pregnant problem, leaving it to the physiologists and the chemists to be solved for us.

THE CHEMICAL LABORATORY

The chemical laboratory was the one first conceived to be a clinical need. Psychiatry was not yet ready for biochemistry 25 years ago, nor for explanations in disordered metabolism of morbid mental moods and activities; neither was organic chemistry yet able to offer practical aid to the mental clinic. But the principle being established and the way opened for its methods, the later history of these laboratories shows the somewhat indirect and obstructed path by which psychiatry is now coming to know its need. In the last 20 years there has been wrought a great transformation, culminating in the new conception of the psychopathic hospital. Dr. Folin gave new character to the expert application of pure chemistry to the problems of nutrition in psychiatry; his research work continued from 1900 to 1909, when, having an appointment in the department of biological chemistry in Harvard Medical School, he was succeeded by Mr. Erdmann; in connection with clinical pathology there was a steady advancement in the recognition and formulation of new and definite problems for chemical investigation. Established since 1900, there are now at least 14 other psycho-pathological laboratories in connection with institutions for the insane and defective in this country; in a few of them research in biochemistry is also included in their investigations, notably at Vineland by Dr. Goddard. It could not be learned at the time of the founding of its own chemical laboratory at the McLean Hospital that there was any other one of the kind in existence, in like institutions, aiming at a permanent association with the clinical work. The exception should be noted of the chemical laboratory of the new asylum at Claybury (1896), where the idea of Mott and Halliburton appears to have been to find what chemical changes took place in definite diseased tissues. Individual researches in such subjects were published prior to 1900, and under the influence of the later widely extended interest in pathological chemistry; but comparatively recent have been the efforts to discover metabolic abnormalities in the insane as a special problem by organized methods for prolonged investigation. It should be mentioned that in 1910 a laboratory of this kind was opened at the Munich Psychiatric Clinic, where the tendency of research is toward the study of changes in definite forms of organic disease. It can be said at least that the chemical laboratory at the McLean Hospital was an early attempt to carry out the "hospital idea."

THE PSYCHOLOGICAL LABORATORY

The psychological laboratory, under the conditions which grew up around it, as we are now prepared to see, pursued a productive course with well-known results. We are brought here to a point of critical interest in the great change in psychiatry in America—a movement still increasing in volume, though discarding much that is found wanting. The McLean Hospital laboratory typically illustrates some important factors in the general change. The psychological department, while pursuing its own special line of work in applying physiological experiment in abnormal psychology, had its course and development peculiarly subjected to collateral influences. To prove this one needs only to look through the brief summaries of work done, in the hospital reports, especially that of 1901 and the following years. The first of these concurrent and more or less controlling influences was in the clinical field, through bringing to this hospital the teachings of the Heidelberg school in 1897 as then developed, when Doctor Hoch was sent there for that purpose on his second mission. We know how these teachings spread and dominated psychiatric thinking in America. The greatest significance belongs to the fact that, on the one hand, the methods of physiological experiment had been brought years before through Stanley Hall direct from Leipsic, and his extended course of study in the laboratory of Ludwig, and moreover had been established here, coupled with concepts of biological chemistry; and that, on the other hand, certain methods of experimental psychology designed for the study of motor and intellectual function by measurement of time factors applied to psychiatry, came here later, also from Leipsic, by way of Heidelberg, but making no use of biochemical and little of physiological explanation. A great contribution to descriptive psychiatry was made by the doctrines of the Heidelberg school in arousing interest in descriptions of mental states. But they perpetuated with some changes of terms the long-accepted formulæ ascribed to Griesinger, except that Kraepelin passed wholly from the emotional criterion of Griesinger to that of activity by "increase or decrease" and "oppositeness," represented by "retardation" and "excitement." This appears to have led largely to the limiting of experimentation to reaction-time and motor effects, and to the insistence upon the analysis and classification of behavior thus differentiated into set clinical pictures and disease forms.

For the good of psychiatry, there should be noted in this connection the extraordinary fact that the extremes of divergence from the real teachings of Griesinger have grown out

of the immediate misconception of them when they were first published, and against which he made formal protest; but this was disregarded to the effect of making him responsible for an interpretation of his conceptions that he never meant, but that has ever since dominated psychiatry.⁶ Believing that these states of melancholia and mania represented simply successive degrees of disorder of the mental and cerebral processes to the "deeper destruction" of their functional integrity, he used the term "depression" clearly in the qualitative sense of mental pain, not confusing it with the notion of something less than normal in contrast with something in "exaltation" more than normal in a quantitative sense. To the soundness of his real conceptions, contemporary with the beginning of the last half-century, is due their vitality and lasting influence.⁷ These should not be forgotten when we recognize the fact that the greatest of the factors of progress formulated in the energy concept, with a steadily moving force toward culminating results, has been determining the long-

⁶ Griesinger, *Mental Diseases*, second edition, 1861: "In employing the term 'states of mental depression,' we do not wish to be understood as implying that the nature of these states or conditions consists in inaction and weakness, or in the *suppression* of the mental or cerebral phenomena which accompany them. We have much more cause to assume that very violent *states of irritation* of the brain and excitation in the mental processes are here very often the cause; but *the general result* of these (mental and cerebral) processes is *depression* or a *painful state of mind*. It is sufficient to recall the analogy to physical pain; and to those who imagine that they make things better by substituting '*cerebral torpor*' and '*cerebral irritation*' for 'depression' and 'exaltation' it may fairly enough be objected that the melancholia there is also a state of irritation."

⁷ Richard Mead, *Medical Precepts and Cautions*, 1755: "Medical writers distinguish two kinds of madness . . . but with this difference, that the one is attended with audaciousness and fury, the other with sadness and fear; and that they call mania, this melancholy. But they generally differ in degree . . . sometimes take each other's place and undergo various degrees of combination." Among the leaders in modern British psychiatry Clouston wrote 30 years ago of the "Descent to Dementia" through melancholia and mania. Twenty years ago Bevan Lewis wrote of melancholia and mania: "Yet, fundamentally different as these mental states would appear to be, we have little doubt that the process of reduction is the same for both, but in maniacal states the dissolution is to a *greater depth*—the difference is one of *degree*." . . . "In mania we must recognize that the excitement of lower levels is one of disorderly, ungoverned license, indicative of the removal of the influence of higher controlling planes." Here are applied in psychiatry the physiological conceptions of Hughlings-Jackson; they are in harmony with Wundt's theory of functional capacity, and the teachings of Sherrington, which are having a notable influence upon modern thought.

impending revolution now going on in psychiatry. Its tendency to this in recent years has been simply a pervasive coordinating movement toward the principles established in general medicine, to which Barker refers with respect to the value of a functional conception of pathology; medicine becoming more scientific, classifications of "clinical types" are replaced by those of "a developmental or genetic character."⁸ True to the genetic method are the new investigations and discoveries in experimental physiology and biological chemistry, proving the remarkable influences of the interdependence of mental and emotional states and physiological adaptations. The new knowledge of such normal reactions is of the utmost importance for psychology and psychiatry; interferences with normal mental reactions in the functional pathology of behavior demand the tracing back to the most fundamental of all the forces that act; there can be no action, however complex the "contest of forces," that is not conditioned by the degree of integrity of the potential energy. The new psychiatry must be founded upon such explaining elementary principles. Anatomical pathology gives us end results.

Proof of the foregoing statements appears in the operation of the concurrent influences that qualified the work of the laboratories here described. The second of these major influences in relation to the course of development of the psychological department was its immediate association with the biochemical research. This is a part of what is shown by the briefest outline of the later stage of progress and by the titles of papers published. The psychological laboratory was newly organized upon a special fund in 1904; under the direction of Dr. Franz, then appointed; it demonstrated the value of such research in pathological psychology through his qualifications as a trained psychologist and his experience in the teaching of nervous physiology. Continuing till 1908, he was then appointed to establish a like service at the Government Hospital in Washington. His successor in the former service, Dr. Wells, has maintained its continuity and carried forward its development by his well-known original investigations. The record of the work done in the three laboratories indicates their stimulating influence as intimate adjuncts of the clinical service. Certain subjects of research show not only the local

⁸ Barker, L. F.: *Methods in Medicine, Boston Med. and Surg. Jour.*, June, 1905: "As medicine has become more scientific, the mind has ceased to be satisfied with such descriptive classifications as the clinical symptoms and syndromes represent and with 'clinical types' set up, and is ever on the alert to replace them by classifications of a developmental or genetic character."

trend, but the general movement in psychiatry toward the conceptions of general medicine.

While psychiatry has been seeing the remarkable extension of interest from a rigid morphologic neurology on one side, to the extremes of speculative psycho-analysis on the other, it keeps to its course on the middle ground of the graver insanities where psychology and psycho-pathology are held to the stern facts of associated physical disorders. The laboratory movement, for the bringing together of the long-disjoined paths of progress of psychology and psychiatry, has a significant example in the present work of the combined clinic and three laboratories at the McLean Hospital, an environment in which academic psychology has had some years of continuous collaboration.

Some particulars of this combined service should be cited here to explain the conclusion to which this review is leading. "A constant attempt has been made to find and apply such psychological and other scientific methods as can be made practical." "A stage of transition in the general laboratory policy was reached when the former conventional methods of experimental psychology proved to be of limited usefulness; the earlier methods of the experimental study of motor and intellectual function by measurement of time factors tended to be outgrown." "In accord with the tendency of the time, a wider use of physico-chemical methods in biological research" was adopted; "attention was given to serological investigations," studies of "psychogalvanic phenomena in relation to emotional reactions" were published. "The principles involved in the biological point of view in psychiatry" were applied; "new means were sought for experimental observation," the laboratories were extended and refitted to meet the new problems. In the later chemical work a method for the determination of the "surface tension of liquids for biological purposes" was published, and a "research on alkylamines" was concluded. "Experimental studies in association opened new fields of research, one of these being concerned with the use of a method of this nature in different forms and stages of the psychoses, and the other with 'the traits of personality which it reflects among individuals in general.'" "In the development of a method for the systematic observation of the personality, susceptible to quantitative treatment, emphasis was laid upon the actual mental difficulties to which the individual is subjected and their proper means of adjustment." "Recognizing the most hopeful tendency in psycho-pathology and normal psychology as founded on the conception of the mind as an adaptive mechanism, an experimental method is needed for the estimation of the adaptive reactions."

The process of applying the methods of normal psychology to the problems of abnormal conditions, and of testing the validity of current contributions to psychology, has had a free and liberal field and competent direction. "The clinical ideal of the study of the whole life and personality of each patient as an individual special problem has become also the psychological ideal." This implied "the need of studies in dynamic psychology, and the investigation of the relation of mental states to the disorders of digestion and nutrition." Time

was spent at the Carnegie Nutrition Laboratory in Boston. The immediately available expert aid of "physico-chemical methods in biological research" had its influence and "determined their wider use here in accordance with the now recognized tendency of the time." (From annual reports of the McLean Hospital.)

The productive results of the combined operation of these laboratories are traceable directly to the projects of the decade 1880-90; they justify the forecast of the essential value of the dynamic concept in psychiatry, although the recognition of it has needed the labor of many years to make its wider use the tendency of the time.

The outcome here is typical of the great interest that has arisen in a considerable number of the institutions throughout the country and of their increasing productiveness within a few years. The laboratories of the McLean Hospital and the U. S. Government Hospital have tended to specialize for the longer time in psychological studies, the former giving more attention than any others to biochemical investigations. A special significance also attaches to the events at the McLean Hospital because of the introduction there of the variations in the formulation of psychiatric doctrine brought from the Heidelberg school, and because of the results of the contact there of the still prevailing system of essentially descriptive psychiatry, with the movement for broader biological explanations. The tendency of the former has been to perpetuate the fallacies of metaphorical descriptions of behavior, and to continue to seek to differentiate new "disease forms" under new names while now becoming constrained to place its failures in a growing group of "unclassified forms"; the tendency of the latter is to the practical conclusion that a functional conception of mental diseases leads to treatment through the study of the whole personality of each individual case. "Psychiatry belongs to general medicine, and mental disease, like bodily disease, is not an entity nor an agency, but the result of normal forces acting under abnormal conditions; the problem requires the investigation of the developmental and genetic character of functional modifications."⁹ Osler asserts: that "the battle ground of medicine in the near future will lie in the fields of clinical chemistry and metabolism."

CONCLUSION

The foregoing recital in outline of events in the progress of psychiatry has needed some detail to show their historical import. While the account in part relates largely to one line of

⁹ Op. cit. "The Problem of Psychiatry in the Functional Psychoses," 1905.

advancement and to one institution, for the sake of its continuity and coherence, it is still only typical of the great movements and progress of the time. It is shown that in the march of development certain forces, alike in general medicine and psychiatry, and not less in psychology, have held their course, though with unequal steps. The historical meaning, revealed by a brief tracing of these trends to their recent leadings, betokens the momentous change now going on in the conceptions of mental diseases.

The problem of overcoming the barrier between mental physiology and mental pathology is one of the greatest importance to psychiatry. That medical training in psychology is desirable needs no saying. It is needed to consider whatever there may be in the methods of normal psychology that does not fit with the problems of pathological psychology.¹⁰ What is there in the mental attitude of the psychologist which differs from that of the research worker in the physiological or physico-chemical laboratory, who has to deal with the physical facts of the mechanism of life?

The history of the laboratories here described reveals such a difference of attitude, and shows that both the psychologist and psychiatrist have been halting between the two leadings—the latter having to compound this disharmony in his practical work. In the course of these two trends of progress in modern psychiatry, there were conflicts and mergings, and the tendency to the emergence of clearer conceptions of scientific psychiatry. In the contemporary movements on the normal plane, beginning about 75 years ago, Johannes Müller, the founder of modern physiology, and his followers developed the methods of experimental research contributing to the rapid advancement in general medicine. Wundt, who had been with Helmholtz at Heidelberg, went to Leipsic in 1872, where Ludwig's laboratory became a center of interest for American physiologists. Academic psychology was seeking in the physical field explanations to support its views of psychic activity. Wundt established his laboratory in 1879 for applying the new mode of the exact methods of physical science to psychology.

The point of present interest in this movement is in the psychology of the emotions and the accepted fixed conceptions of their associated physical contrasts. Wundt's theory

¹⁰ F. L. Wells, "The Advancement of Psychological Medicine," the *Pop. Sci. Monthly*, Feb., 1913. "The discourse of the medical man is one of problems, of the psychologist, one of methods; which under present conditions could scarcely be otherwise. The difficulty is that the methods of normal psychology and the problems of pathological psychology do not fit."

of the "three dimensions of feeling" expressed in pairs of "opposites,"

agreeableness	excitement	strain
disagreeableness	repose	relaxation

became a large problem of psycho-physical research. This great experiment and the vast literature written around it in 30 years in volumes of description and discussion, to fit with conscious experiences a like oppositeness of normal organic reactions, has been most productive in broadening the fields of research, although a negative conclusion has emerged concerning the "three-dimension theory."¹¹ The psychologists have done their part along their lines of approach to the recognition of the problem of the mind as an adaptive mechanism. But to the same end, and proceeding from the rapid advancement in physiological and physico-chemical experiment, a revolution of ideas has been wrought, of which an example is the final dislodgment of the ancient conception of an oppositeness of physical reactions of "integration and disintegration," through the later discoveries proving the protective relations between normal emotional and physiological reactions. In the normal field this strengthens the foundations for cooperation in the merging of the problems and methods of psychology and medical research.

In the abnormal field the special place of these laboratories may now be pointed out by briefly recapitulating the meaning of some of the main events here narrated. In conclusion it remains also, with respect to the notable influence of the Heidelberg school, to specify more particularly what its doctrines were with reference to the results of their contact with the purposes of the combined laboratories; the manner of their introduction has been described. The beginnings of modern psychiatry are ascribed to Griesinger, who, in the awakening of his time, recognized the deeper physiological truth which he failed to impart. In the order of nature and universal experience the contrasts of mental pleasure and pain have been associated with many of the implications of exaltation and depression. The alienists rested upon Griesinger's verbal formulations; these have served the purpose of describing "clinical types set up," and even tended to antagonize the

¹¹ A Study of the Relations between Certain Organic Processes and Consciousness. J. R. Angell and H. B. Thompson. *Psych. Rev.*, Vol. 6, 1899.

Organic Changes and Feelings. J. F. Shepard. *Am. Jour. Psych.*, Vol. 17, 1906.

Elements of Physiological Psychology, Chap. VII. Ladd and Woodworth. New Ed. 1911.

seeking for explanation through physiological principles with which, in fact, they do not fit.

The psychiatric movement has been substantially governed by the practical principles of the "supporting treatment"—the energy concept, under the influences of general medicine, which prompted the founding of the McLean laboratories, in their combination, and the change proposed in 1887 of the Griesinger formula to fit both the mental and physical facts. The inspiration to psycho-physical research then brought by Stanley Hall from the laboratories of Ludwig and Wundt, chiefly the former, did not change the physiological attitude; it was sought to escape from the domination of the ancient descriptive conceptions lacking explanations of the obvious changes of physical functions. When later the teachings of the Heidelberg school were brought in, they proved to revive the doubted formula; with some words of elaboration upon the model of the "three-dimension theory" the "triad of opposites" was framed and came into general use:

exaltation	excitement	flight of ideas
depression	retardation	difficulty of thinking

with differentials of "increase and decrease" and determinations of disease-forms by reaction-time experiments.

This position was essentially descriptive and exactly contrary to that of Griesinger and the original purpose of the laboratories. It had no leaning toward the proposed physiological and physico-chemical explanations; the four missions of inquiry to psychiatric centers in Europe, 1888-1901, found no prolonged measures established for such combined research, but rather a lack of hopeful views of it. The clinical field of the McLean laboratories became the scene of an attempt to harmonize the perpetuated descriptive attitude and the explanatory attitude. In the first years the former flourished more, but the latter persisted. In the later period of nearly 15 years of expert work in "pure chemistry" and "pure psychology" conjoined in the clinic there emerged another change of scene indicated by the quoted description of some of the work done. The earlier conventional methods of measurements by time factors were proved to be of limited usefulness. There was increasing recourse to physico-chemical investigations of nutrition and other problems, and to new collaboration in methods for "studying the problems of the whole man" immediately presented by the physical facts of the clinic.

In the greater experiment formed by the years of work of these laboratories the primary problem was held in the proposition that all the activities represented by behavior, whether

normal or abnormal, are always conditioned by the state of the energy potential, whether adequate or inadequate, modified or inhibited by interferences. The field of mental disorders is nature's laboratory, where the psychologist's methods of analysis must fit both the mental and physical problems of the psychiatrist. The energy concept being held as implying the storage of energy in living substance, and the law of physiological use as implying growth in functional power, these physical facts are extended by the new advances in the physiology of protective and defensive reactions. This new proof sustains for psychiatry the conception of the effects of overuse, waste in excess of repair, irritable weakness with lowering of thresholds, failing inhibition with increasing activity tending to losses through exhaustion by degrees of sensori-motor function to states of lethargy, and death. In the growing recognition of the constant presence of such elementary principles conceptions of a developmental or genetic character emerge for dealing with the complexes of abnormal mental and physical conditions. Thus there is revealed the broader field of explanation for the new psychiatry.

The dynamic principle long recognized in practice has prevailed in the work of these laboratories, although usage still clings to the old formulae, which do not fit the physical facts. Psychiatry, by laying broader foundations, is becoming more completely free to frame its creed with a new ritual upon the coming revelations of physiology.

NOTE.—In this account of the laboratories only brief reference could be made to the genesis and course of forces proceeding from psychology into psychiatry and their relations to the modern advancement in the medical sciences. Yet the leading purpose here is to indicate the causes and import of the general laboratory movement in the development of psychiatry; this being still in its early stages in the seeking for clearer theory to fit the facts underlying the great progress in psychiatric practice and to fix attention upon the chief interest, the account of the contributive work of these laboratories is kept, as nearly as possible, objective and impersonal. But the outcome of all prevision in such matters being dependent upon the responses of the individual workers, it is of interest to psychology to note how those brought into contact here with the interacting influences of the combined laboratories and clinic produced substantial proof of the soundness of the method for the mutual promotion of progress in all these special fields.

It is due to the laboratory workers to make further acknowledgment of their efficient zeal and their valued contributions responsive to the opportunity. These being aids to the clinical service, this remains the substantial and lasting basis of the whole work. A true estimate of this can not be made without a large measure of recognition of the essential value of the intelligent co-operation of those engaged in the clinical service. Acknowledgment of his im-

portant work in this service is due especially to Dr. Tuttle through his long service since 1879, and to Dr. Abbot since 1890 except a brief interval, to the present time. It ought not to be omitted here to note the salient facts of the progress in treatment and its concurrent influences in clarifying the related psychologic and psychiatric problems. From the beginning of this period of nearly forty years there was a continuance of the tendency to the lessening use of controlling drugs as adjuvants to the "supporting treatment" in which the alienists had been the leaders of the century. A summary of the marked progress in this regard was published in 1894.¹² Dr. Tuttle's continued contributions to this progress, through conservative, painstaking observation and disposition to prove all things in theory and practice, made so much practical advancement in the use of physiological therapeutics, both in the physical and mental fields, that he was able to make the following report in 1913: "No striking changes in methods of treatment. Emphasis is still laid on the superior advantages of out-of-door exercise, full feeding, and hydrotherapy for its tonic or soothing effects as against sedative and hypnotic drugs, which practically are never prescribed."

The methods of treatment described are an achievement as original and independent as any in practical therapeutics by the tests of experience,—a logical demonstration of cause and effect. They have an important bearing upon the validity of the psychological observations in the combined services as essential aids in the shaping of psychiatric progress by the exclusion of artificial interferences with the study of both psychopathological and associated normal adaptive reactions. Case histories in the literature concerning "disease-forms" are always open to question when the "medication" is not mentioned; the common omission of this detail of treatment suggests the possible and often probable sophistication of symptoms by drug-effects. It is significant of the coordinating influences in the combination of these services, toward the long desired overcoming of the barrier between mental physiology and mental pathology, that Dr. Abbot's "adaptive reaction" has been from his early work of a physician in the wards to the direction of the special clinical and pathological departments and to the attitude of a psychologist whose contributions are informed with thorough comprehension through a practical psychiatric training.

The interest to psychology of such an account as this is a very special one in the universal movement on all sides for the solving of the chiefest of all problems. To the master science the contributive work on the physical side is being mostly devoted to the study of the causative effects of organic diseases upon mental integrity; on the other hand there are extremes of the admirable zeal in the analysis of the thinking process tending to exclude attention to the physical facts, and promote the continued formal study of "clinical types set up,"—the progressive spirit working along lines bounded by traditional conceptions. The interest of the present situation to psychology is that when it turned to physical facts, physiology and psychophysics, it laid the sound foundation upon which the genetic method is building up impregnable constructive conceptions, this process being concurrent with the trend of the same forces in general medicine. After twenty years or more psychology had freed itself by experiment from the bondage of the ancient conceptions embodied in the "three di-

¹² Progress in the Care and Treatment of the Insane during the Half-Century. E. Cowles, *Am. Jour. Insanity*, 1894.

mension theory," as Angell and his students showed the conclusion to be. Yet psychiatry has continued, for almost another score of years, to "set up" the motive factor of feeling, which lies at the basis of adaptive reactions, in terms describing the true contrasts or "oppositeness" of the *qualities* of mental pleasure and pain but in words of double meanings falsely implying a like "oppositeness" of the physical facts. Griesinger and others knew better through the more fundamental energy concept, but that availed nothing; medical literature has come to be full of reliance upon it; but psychiatry, still unable to work out explanations through its misconceptions, turns away from the wealth of newly known facts in the physiological mechanism saying "the symptoms are all we have." Can the question be answered: Why continues this disjunction,—this resistance since Griesinger's time? Is it something inherent, atavistic? Our prehistoric forebears found comfort and safety in the trees,—they feared the prowling dangers of the earth beneath; they were cave dwellers in the cliffs, worshipped the sun in the high heavens and feared the dragons of the great abyss in the waters under the earth. Have we this disposition ingrained, solid—something that must stay, ever to be interred with our bones? The answer of psychology is that, under general principles that apply to a large class of the emotions, the motor reactions called forth as a part of the bodily resonance are adapted for the defense and preservation of the individual, and that the same or other reactions operate to the same end for the species; therefore evolutionary biology is justified in considering the bodily expressions of emotion as instinctive actions reminiscent of ancestral ways of life. (Ladd and Woodworth.)

Our inherited attitude toward life in its normal relations is set upon the instinctive conviction that we should seek pleasure and avoid pain, like ease and dislike labor, and recognize the protection of rest and the warnings of fatigue. Yet we subject ourselves to toil and pain for gaining future ease and the highest good, use our fears for defense and grow strong in the struggle for existence; we rejoice in overcoming. The psychologist, finding in this no confirmation of his former theory concerning the physical facts, may have little difficulty in adjusting his thinking to the play of the emotions on the normal plane where emotional feeling is secondary to the results of ideation and experience; he may content himself with introspection. But the physician finds his work on the pathological plane where the prevailing affective tone, both of morbid sadness and joy, proceeds from sources of real physical disorder and losses of the integrity of function. On the normal plane the emotional changes may be described intelligibly, though figuratively, as from low spirits to high spirits; both being normal they may vary alike with increase of intensity, activity, and force still under normal control. But the physician has to deal with pathological changes which always imply failure of functional integrity; the losses of control, which is the essential index of the energy content, are represented by the "irritable weakness" shown in the increase of activity in restlessness, sense of inadequacy, and consequent "mental pain;" then failure may continue through further declension of functional integrity shown in deeper sensory losses by the *fictitious* sense of well-being, with lessening control and more and weaker activity to complete loss.

It should be said that these observations, repeated in other words from foregoing pages, describe a type of cases that show such courses of reduction under stress as in Nature's experiments with normal

subjects,—such as hardy shipwrecked sailors and lost wanderers in the desert who decline through stages of despair, delirium, and exhaustion to dissolution. In the mass of cases there may be many individual variations as to which of the complex of functional factors goes first to annulment,—when there may be seeming or real stupor,—a partial or general retardation in some reflex reactions; but there is a remarkable uniformity in the essential elements of the clinical pictures, whether from regular reductions of the sustaining force or through interferences. Every psychiatrist knows the meaning of the “deeper levels of dissolution,” and is governed by the principle in his practice. Here comes again the question of the resistance of psychiatry since Griesinger’s time to the fundamental principle now long proven by experiment in psychology and physiology. Is it that the psychiatrist, who does not experiment, is so set in his ancestral, arborescent, cliff-dwelling, instinctive conceptions that he cannot reconstruct his ambiguous formulae to fit the facts he knows? Psychology and physiology have much to learn from psychiatry of the variations of physical facts that must condition mental activity; there should be somewhere a foundation upon which the present divergencies of psychology can come together; in its turn not the least of its duties is to persuade psychiatry to believe the meanings of the things it already knows; but much more is needed to fill the larger place that is waiting for true guidance of the master science in the preventive and curative work of the mental clinic.

Discontent with things as they are avails but little; this account is purposely limited to what has been done so far in the prolonged attempt to break the bondage of tradition and words. The first need in the present time of great promise is to set a true foundation upon which all research and psychoanalysis may build. The energy concept is most fundamental and must be reckoned with throughout; some constructive proposition is in order here,—to point the moral if not to adorn the tale. Under this conceptions the relations are shown of the essential elements of the melancholia-mania symptom groups; these are comprehended in four stages, or phases: (1) Neurasthenic, (2) Melancholic, (3) Manic, (4) Exhaustion, ending in dissolution. As there are no sharp “border lines” anywhere between the phases the expedient of “mixed phase” description must be applied alike to all of the variables of transition from one characteristic phase to another. In the typical course of lessening functional capacity the order of the condition changes can be best explained in terms of control. The losses of poise at the sensory and motor thresholds, in both the thinking and physical reactions, represent the reductions of physiological inhibition which is the index that varies directly with the energy content which may continue regularly to exhaustion and dissolution. This curve of inhibitory control consistently harmonizes, to the end, with the energy efficiency,—allowing for the variable interferences above explained. The activity, or “excitement” criterion is a false index; it varies inversely,—the more restlessness and excitement the more “irritable weakness.” This metaphorically carries the graphic curves of “increase” to high and feeble levels on the *quantity* scale; thence they must drop through the whole scale of successively waning and exhausted areas of contributive action,—(“the disease crosses the normal line” according to an eminent writer), in order to complete the representation of the terminal energy subsidence in retardation, stupor and death.

It should be said further that it is not meant in this account of the laboratory movement to minimize the great contributions of the Heidelberg studies to psychiatry. While the measurement of time factors appears to be of limited usefulness, with respect to the "three dimension theory" as in experimental psychology, yet the methods of case study and clinical analysis have been developed upon the true basis of the general principle of reflex action in the physiological mechanism. It is proved that these physical factors are not to be ignored, but that they furnish a guide to an orderly method for the introspection which helps to reveal not only the relations of the mental activities among themselves but also the controlling forces of the conditioning and always changing adaptations of the physiological reactions.

The conclusion that emerges may be restated here. Wundt, representative of the psychologists' attitude, formulated current conceptions in the proposition concerning the feeling-factors and sought proof for it in physiology, reaching the verdict not proven, but leading to great advancement through the precise study of physical facts. On the other hand the formulation of the energy concept was contemporary—even prior, in the practice of psychiatry. The inception of these laboratories started with this genetic principle, discarding early the physical import of the depression-exaltation formula. The validity of the energy concept, and the genetic principle as in general medicine, has been worked out in thirty years or more in these laboratories. Meantime the Wundtian theory reached a negative conclusion nearly twenty years ago. The moral of the whole matter has many specifications; among them it appears that psychology, on its part, having freed itself from the ancestral theory, has yet to apply the new knowledge of the real physical reactions that condition the expression, through the common path, of all the findings of the diverging specialists in psychology; they have yet to fit the facts that the psychiatrist knows. Psychiatry, on the other hand, finds in the pathological plane something more in the ancestral theory than its comparatively academic and negligible import for normal psychology; it has not adopted the correction that psychology and physiology have found. Having not yet freed itself from the bondage of metaphorical description, it still contents itself in its use of "forms of words" that have no physiological meaning, and block the interest in explanation. The growth in facile description and the practice of keen analysis of the mental activities (symptoms and behavior) are so satisfying that psychiatry stays superficially content with a verbal formula false in theory and fact. The force of this lingering error is surely though slowly waning before the soundness of the empirical methods and practice long wrought out. To hold the place that belongs to it psychiatry has its greatest opportunity in no longer neglecting the aid that all contributing sciences are striving to offer.